DOCUMENT RESUME

ED 392 788 SP 036 540

AUTHOR Simpson, F. Morgan; And Others
TITLE Evolution of Cognitive Styles for Preprofessional Educators.
PUB DATE Nov 95
NOTE 25p.; Paper presented at the Annual Meeting of the Mid-South Educational Research Association (Biloxi, MS, November 9, 1995).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Style; Education Majors; Elementary Secondary Education; *Field Dependence Independence; Higher Education; Learning Strategies; Preservice Teacher Education; *Sex Differences; *Student Characteristics; *Thinking Skills
IDENTIFIERS *Group Embedded Figures Test; Preservice Teachers

ABSTRACT

The cognitive styles of Education majors at a southern university were examined over a five-year period. The Group Embedded Figures Test (GEFT) was administered to 537 students in an introductory education course. This test identifies field-dependent (FD) and field-independent (FI) learning styles. Two hundred twelve students were retested at the conclusion of their internships. In the interim, course grades across six required undergraduate courses were compared with cognitive style. Findings indicated that the students became more field-independent (mean increase of 1.5). Males tended to be more FI than females, but females performed better academically across the six courses. Further significant correlations exist between the students grades in the six courses, and the students with the higher course grades had higher embedded figures scores (indicating they were more field-independent). Significant F values were found in four courses. A similar pattern, though not significant, was found in the other two courses. Students with higher course grades generally had higher mean embedded figures scores in six selected courses. (Contains 24 references.) (Author)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 392 788

Running Head: EVOLUTION OF COGNITIVE STYLE

Evolution of Cognitive Styles for Preprofessional Educators

F. Morgan Simpson, Sarah C. Portis, Vaughn Snyder, and Lynne Mills

Auburn University at Montgomery
Montgomery, Alabama 36117-3596

1995 Annual Meeting
Mid-South Educational Research Association
Biloxi, Mississippi
November 9, 1995

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
F Morgan Simpson
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

SP036540

BEST COPY AVAILABLE

Abstract

The cognitive styles of Education majors at a southern university were examined over a five-year period. The Group Embedded Figures Test (GEFT) was administered to 537 students in an introductory education course. This test identifies field-dependent (FD) and field-independent (FI) learning styles. Two hundred twelve students were retested at the conclusion of their internships. In the interim, course grades across six required undergraduate courses were compared with cognitive style. Findings indicated that the students became more field-independent (mean increase of 1.5). Males tended to be more FI than females, but females performed better academically across the six courses. Further significant correlations exist between the students' grades in the six courses, and the students with the higher course grades had higher embedded figures scores (indicating they were more field-independent). Significant F values were found in four courses. A similar pattern, though not significant, was found in the other two courses. Students with higher course grades generally had higher mean embedded figures scores in six selected courses.

Evolution of Cognitive Styles for Preprofessional Educators

Cognitive style research is not a new phenomenon. Witkin and his associates (Witkin, Moore, Goodenough, and Cox, 1977) conducted research based on studies that had been initiated as early as the late nineteenth century. Witkin's studies involved perception of visual stimuli. These studies investigated subjects' abilities to disembed figures that were hidden in a larger field of stimuli. Other studies have revealed additional findings related to styles of learning.

Individuals have a predisposition to certain cognitive, affective and physiological styles of learning; however, personal development and maturation, culture and experience influence style (Cornett, 1983). Even as maturational changes occur, most people remain somewhat fixed in cognitive style. Males tend to be more field independent than females, but it is unknown if cultural influences are involved (Sigel & Brodzinsky, 1977). Cognitive style addresses how individuals learn, perceive, think, and problem solve. Affective dimensions of learning style include individual personality and emotional traits, while physiological dimensions of learning style relate to individual reactions to environmental and sociological conditions (Reiff, 1992).

Cognitive style influences academic major (Highhouse & Doverspike, 1987; Witkin, 1976). Individuals who are field-dependent (FD) tend to select fields like teaching, counseling, sales, humanities, and social sciences, while individuals who are field-independent (FI) tend to select scientific, mathematics, engineering and related fields.

An understanding of how people learn is an essential component of a teacher-preparation program. Learning styles research indicates that how teachers teach and interact with their students and how students learn and interact with others are affected by learning styles (Reiff, 1992). Learning

styles are defined as patterns that direct the teaching, learning process.

Cognitive style influences approaches to learning. Field-dependent learners are attuned to learning and retaining social information and they enjoy group interaction. These students will benefit from working in groups and receiving feedback from peers and the teacher. They favor structure and seek teacher direction and feedback. They are affected by criticism and they benefit from instruction in problem solving. Field-independent learners, on the other hand, are task-oriented and they set self-regulated goals. They tend to be more skilled at learning and using rules. They can organize and analyze a plan and they seek less guidance than do FD learners. They are less affected by criticism and they like to work individually (Piotrowski, 1984; Witkin, Moore, Goodenough, & Cox, 1977). Field-independent learners prefer relatively impersonal situations and they maintain greater psychological and personal space from others than do FD persons (Greene, 1976).

Cognitive style affects teaching methods and curricula. Field-dependent teachers tend to use discussion more and FI teachers tend to use lecture more in their classes. Field-dependent teachers tend to use more democratic classroom procedures, while FI teachers lean toward more direct methods of influencing students (Witkin, 1976). Neill (1990) and Reiff (1992) suggest that knowledge about learning styles can aid the teacher in broadening teaching methods and curricula to accommodate more students' preferred styles. Classroom management and lesson planning based on learning styles knowledge facilitates greater learning on the part of all students. As accommodations for students' learning styles are made by instructors, students are exposed to a variety of ways to learn and their repertoire of styles is expanded. This procedure strengthens their school performance (Matthews, 1991a). Matching instructional style with student learning style may not increase student learning (Macneil 1980); however, teachers and students tend to rate one another more positively when their cognitive styles are matched (Witkin,

1976). Teacher versatility in structuring curricula and instructional strategies seems to be essential for effective teaching to occur (Goodlad, 1984).

Cognitive styles of Education majors appear to have an impact on performance in pre-service education coursework (Wieseman, Portis, & Simpson, 1992b). A two-year study of 537 students enrolled in an introductory education course revealed that students with higher means on the Group Embedded Figures Test (Witkin, Oltman, Raskin, & Karp, 1971) tended to perform academically better than those with lower means. Matthews (1991b) found in a study of upperclassmen across majors that Education majors tended to select "conceptual over applied learning styles and social over independent learning styles" (p.19). She found some students in this group preferred a neutral style which she and Canfield (1988) report is associated with students whose performance is less successful than students who have a preferred style. She further points out that Education majors generally do less well on standardized tests that require application. She, along with Claxton & Murrell (1987), advocate that Education faculty use a variety of instructional strategies that address match/mismatch of styles between instructor and student to facilitate expansion of student styles. This practice may assist students in developing skills needed to improve performance on standardized tests.

Purposes

The present study examines cognitive styles of preprofessional Education majors. The purposes of this descriptive study were:

1. To determine if student scores on the Group Embedded Figures Test (GEFT) remained static over the period of baccalaureate teacher preparation.
2. To compare students' academic performance across curricula.

3. To investigate the relationship between GEFT scores and course grades in selected required courses.

Method

Materials

The Group Embedded Figures Test (GEFT) was designed by Witkin, Oltman, Raskin, and Karp (1971) to determine field-dependent and field-independent cognitive styles. The GEFT is a timed test designed for group administration. The test requires subjects to locate and mark embedded figures in eighteen complex designs. The range of scores is 0 (field-dependent) to 18 (field-independent). Scores indicate the degree of cognitive style, and are neutral in value. Positive characteristics are associated with styles at both ends of the continuum.

The GEFT has been used in over 2,800 studies to screen large numbers of subjects and to conduct correlational studies. Such usage is in line with the stated purposes of the instrument (Cantwell, 1986). Although Cantwell states that more data are needed in the manual regarding different group norms, reliability, and validity, he regards it as appropriate for use by researchers studying cognitive styles.

Procedures

The researchers administered the Group Embedded Figures Test during part of one class session in every section of a freshman level introduction to education course for two academic years (1989-90 and 1990-91). The test was repeated as the same students completed their internship during the senior year. This research reports the retesting of the students who completed their internship in spring and fall of 1992; winter, spring, and fall of 1993; and winter, spring, and fall of 1994; winter, and spring of 1995. Course grades in six courses required of all undergraduate education majors plus the cumulative grade point average were collected for the subjects at a southern university.

Subjects

The subjects were students enrolled in a freshman level introductory education course at a southern university. Data from 537 students enrolled in the course were collected, and results from that study are reported in Wieseman, Portis, and Simpson (1992a). The same students are being retested at the completion of the internship. Data were collected from 212 students. One hundred eight-five students were female and twenty-seven students were male. Additional data on the other students will be collected at the conclusion of their internships. The researchers did not collect data on race or teaching field.

Results

Initial and intern field-dependent/independent scores, course grades from six courses, cummulative grade point average, and gender were collected for all subjects in the study. The comparisons between the initial and intern field-dependent/independent scores for all students and gender groups are reported in Table 1.

Insert Table 1 about here

The mean field-dependent/independent scores for all students, both females and males, were higher during the internship. Higher mean scores during the internship suggest that the Education students became more field-independent learners as they progressed through the teacher-preparation program. Student scores on the Group Embedded Figures Test did not remain static over the period of baccalaureate teacher preparation. The graphic representation of the field-dependent/independent scores by gender for the initial and intern testing are reported in Figure 1.

Insert Figure 1 about here

The box plot represents the range and central tendencies of the data. The graphic representation of the middle 50% of the students is shown in the box. The box plot further illustrates the tendency for the students to have higher scores at the completion of the internship, thus indicating the students became more field-independent.

When the initial and intern GEFT scores were compared significant t-test results were found for all students ($t = 6.60$, $p = 0.0001$), and females ($t = 6.21$, $p = 0.0001$). The results for the males ($t = 2.25$, $p = 0.03$) were also significant. Students' field-dependent/independent scores changed and became more field-independent between their initial testing in the introduction to education course and their testing at the completion of the internship. The mean increase embedded figures score for all students was 1.5. Scores for the female students increased an average of 1.55 while the scores for males increased an average of 1.15.

Course grades were collected for the 212 students in six courses required of all undergraduate education majors. The courses selected were introduction to education (FED 104, Introduction to Professional Education); history (HY 102, World History Since 1648); English (EH 102, English Composition II); biology (BI 101, Principles of Biology); speech (COM 101, Introduction to Human Communication); and fine arts (one of the appreciation or history courses in either art, music or theater). Students were not enrolled in a single fine arts course; rather, students selected one of nine possible courses. Students enrolled in the internship are awarded S (satisfactory) or U (unsatisfactory) grades rather than traditional letter grades. For this reason, intern grades are not included in this report. The

means and standard deviations for the course grades and cumulative grade point averages, along with t-test results, are reported by gender in Table 2.

Insert Table 2 about here

Female students had higher course grade means then males for all six courses and for cummulative grade point averages. Comparisons between the grades of male and female students in each course produced significant t-test results in only one course, fine arts. Results in the comparisons for the other courses were not significant. Students in FED 104 had the highest mean score (3.40) and students in HY 102 had the lowest mean score (2.73). One student did not have a fine arts grade and another did not have a communication grade on their transcripts, so the total number and the number of female subjects are different for the other courses.

The course grades were compared using the Pearson Correlation Coefficient. The correlations of the grades in the six courses are reported in Table 3.

Insert Table 3 about here

The initial embedded figures scores were found to be significantly correlated to the grades received in FED 104, EH 102, and fine arts. The intern field-dependent/independent scores were also found to be significantly correlated to grades in all of the selected courses except COM 101. Significant correlations were found between the grades in all of the courses. For example, the grades in FED 104 were significantly correlated to the grades received in each of the other five courses. The significant intern score/grade correlations suggest that students' scores and grades followed similar patterns. The signficant course grade correlations suggest that the

grades received by students in the six courses also followed similar patterns.

To determine if other response patterns existed, difference scores were calculated by subtracting the grades in the six courses two at a time for each student. The difference scores and the t-test results are reported in Table 4.

Insert Table 4 about here

Significant mean difference scores were found between FED 104 and each of the other courses. The positive mean difference scores indicate the FED 104 course grades were generally higher than the course grades in the other five courses. Significant mean difference scores were also found between HY 102 and each of EH 102, COM 101 and Fine Arts. Generally, significant mean difference scores were found between courses except for the HY 102/BI 101, the EH 102/BI101, and the COM 101/Fine Arts comparisons. Therefore, students' academic performance as measured by course grades was not similar across the curricula.

The course grades, and intern field-dependent/independent scores were further analyzed by Analysis of Variance (ANOVA). A factorial ANOVA was calculated by partitioning the course grades and intern scores for each of the six courses. ANOVA results, plus group means and standard deviations, are reported in Table 5.

Insert Table 5 about here

Significant F values were found in FED 104, HY 102, EH 102, and BI 101. In these courses (FED 104, HY 102, EH 102, and BI 101), as well as the other courses, students with higher course grades generally had higher mean embedded figures scores. These differences were significant for four of the courses,

BEST COPY AVAILABLE

but the same basic pattern, though not significant, occurred in the other two courses (COM 101, and Fine Arts). There is a relationship between GEFT scores and course grades.

Discussion

The results of this investigation indicate that Education majors who were identified as having a field-dependent cognitive style when tested in their first education course, tended to become more field-independent by the end of their internship. This finding suggests that while style may not change there is movement toward field-independence. Males tended to be more field-independent than females, although females performed better academically across curricula.

The findings indicate females as a group are more field-dependent. Females also tended to have higher grades. Yet, the findings in this study suggest that students with higher embedded figures scores had higher course grades. It appears this is a conflict in findings. The tendency of students' moving toward field-indepencence is along a continuum. Thus, there appears to be no discrepancy with the major findings of this study.

The students involved in this study were screened twice between the two administrations of the Group Embedded Figures Test by the School of Education. Students were screened for Admission to Professional Education and for admission to the Internship. Students not maintaining a 2.50 GPA are screened out of the School of Education. The researchers did not identify students who disenrolled. The researchers do not know how many students will not be admitted to both professional education and the internship. This study describes only the students from the initial pool of 537 students who have completed the internship. No control group was used.

Studies of retention of college students have focused primarily on remedial study skills and support services; however, they indicate that these traditional approaches are inappropriate for a large number of students (Ford,

BEST COPY AVAILABLE

1981; Robyak & Downey, 1979). Recent research (Nelson, Dunn, Griggs, Pimavera, Fitzpatick, Bacillious, & Miller, 1993) found that students who were taught to use their learning style preferences had greater achievement than students who have little or no exposure to instruction in using learning style preferences in developing study skills. Students with this instruction were found to be more apt to remain in college.

Research (Thompson & Crutchlow, 1993) seems to indicate there is little evidence that learning style has a significant impact on learning. It does impact student performance (Mathews, 1991a; Wieseman et al., 1992b).

This study documents the changes in field-dependent/independent scores over time for preprofessional baccalaureate-level students. Melancon and Thompson (1987) report a number of studies that indicate an increase in field-independence from childhood until mid teens, and stability into late in life. The present study suggest that subjects tended to remain somewhat stable in cognitive style but moved along the continuum toward becoming more field independent. This trend appears to be desirable for teacher-education majors since teacher versatility in structuring curricula and instructional strategies seems to be essential for effective teaching to occur (Goodlad, 1984).

Student grades in the six selected courses seem to follow similar patterns. The significant correlations between the course grades indicate that students performed in similar fashion in the selected courses.

The embedded figures score/course grade analyses suggest that there is a relationship between the two. Students with higher course grades had higher embedded figures scores in all six courses. The differences in four of the six courses were found to be significant.

Continuing research that employs the same design and instrument will increase the number of subjects and enhance the power of the results. Additional research comparing cognitive style and academic major (though not a

part of this research design) would add a further dimension to current findings; for example, research indicates that cognitive style influences vocational choice and academic performance (Highhouse & Doverspike, 1987; Witkin, 1976). Further study might focus on the match-mismatch of student and instructor cognitive styles since research implies that the match-mismatch of cognitive styles may be a factor in student academic performance (Macneil, 1980; Witkin, 1976).

References

Canfield, A. A. (1988). Learning styles inventory manual. Los Angeles Western Psychological Services.

Cantwell, Z. M. (1986) . Group embedded figures test in Keyser, D. J., & Sweetland, R. C. (Eds.). Test Critiques (5), (pp. 189-197). Kansas City: Test Corporation of America.

Claxton, C. S., & Murrell, P. H. (1987). Learning styles: Implications for improving educational practices. (ASHE-ERIC Higher Education Report No. 4.) Washington, D.C.: Association for the Study of Higher Education.

Cornett, C. (1983). What you should know about teaching and learning styles. Bloomington, Ind.: Phi Delta Kappa Educational Foundation.

Ford, N. (1981). Approaches to the study and teaching of effective learning in higher education. Review of Educational Research, 51, 345-377.

Goodlad, J.A. (1984). A place called school. New York: McGraw-Hill.

Green, L. R. (1976). Effects of field dependence on affective relations and compliance in dyadic interactions. Journal of Personality and Social Psychology, 47(3), 749-752.

Highhouse, S., & Doverspike, D. (1987). The validity of the learning style inventory 1985 as a predictor of cognitive style and occuplational preference. Educational and Psychological Measurement, 47(3), 749-753.

Macneil, R. (July/August, 1980). The relationship of cognitive style and instructional style to the learning performance of undergraduate students. Journal of Educational Research, 73, 354-359.

Matthews, D. B. (1991a). The effects of learning styles on grades of first-year college students. Research in Higher Education, 32 (3), 253-268.

Matthews, D.B. (1991b). Learning styles of education majors: Are they similar to those of other students? SRATE Journal, 1 (1), 28-32.

Melancon, J.G., & Thompson,B. (1987). Measurement characteristics of a test of field-independence: Literature review and development of the finding

BEST COPY AVAILABLE

embedded figures test. (ERIC Reproduction Service No. ED 292 823).

Neill, J. (1990). Making sense of style. Educational Leadership, 48 (2), 4-9.

Nelson, B., Dunn, R., Griggs, S. A., Primavera, L., Fitzpatrick, M., Bacilious, Z., & Miller, R. (1993). Effects of learning style intervention on college students' retention and achievement. Journal of College Student Development, 34, 364-368.

Piotrowski, C. (1984). Locus of control, field dependence-independence as factors in learning and memory. (ERIC Document Reproduction Service No. ED 247 495).

Reiff, J. C. (1992). Learning styles. Washington, D.C.: National Education Association.

Robyak, J., & Downey, R. (1979). The prediction of long-term academic performance after the completion of a study skills course. Measurement and Evaluation in Guidance, 12, 108-111.

Sigel, I. E., & Brodzinsky, D. M. (1977). Individual differences: A perspective for understanding intellectual development. In H. Hom & P. Robinson (Eds.). Psychological Processes in Early Education. New York: Academic Press.

Thompson, C. & Crutchlow, E. (1993). Learning style research: A critical review of the literature and implications for nursing education. Journal of Professional Nursing, 9 (1), 34-40.

Wieseman, R. A., Portis, S. C.,& Simpson, F. M.(1992a). A follow-up study on learning styles: Using research to facilitate educational excellence. (ERIC Reproduction Service No. ED 343 867).

Wieseman, R. A., Portis, S. C., & Simpson, F. M. (1992b). An analysis of the relationship between cognitive styles and grades: New perspectives on success or failure of pre-service education majors. College Student Journal, 26(4), 512-517.

Witkin, H. A. (1976). Cognitive style in academic performance and in teacher-student relations. In S. Messick & Assoc. (Eds.) Individuality in Learning: Implications of cognitive styles and creativity for human development. (pp. 173-192). San Francisco: Jossey-Bass.

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. Princeton, N. J.: Educational Testing Service Research Bulletin.

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. E. (1971). A manual for the embedded figures tests. Palo Alto: Consulting Psychologists Press.

Table 1

Mean and Standard Deviation Field Dependent/Independent Scores by Gender

Group	N	%	Mean	SD
Initial Scores				
All Students	212	100	9.78	5.10
Female	185	87	9.43	5.13
Male	27	13	12.15	4.21
Intern Scores				
All Students	212	100	11.28	4.73
Female	185	87	10.98	4.76
Male	27	13	13.30	4.03

Table 2

Mean and StandardDeviation of Course Grades by Gender and t-test

COURSE	N	Mean	SD	T	p
FED 104	212	3.40	0.78	0.68	0.50
Female	185	3.41	0.78		
Male	27	3.30	0.78		
HY 102	212	2.73	0.97	0.83	0.41
Female	185	2.75	0.98		
Male	27	2.59	0.89		
EH 102	212	2.93	0.84	1.28	0.21
Female	185	2.96	0.84		
Male	27	2.74	0.81		
BI 101	212	2.82	0.92	1.80	0.08
Female	185	2.86	0.93		
Male	27	2.56	0.80		
COM 101	211	3.21	0.75	1.71	0.10
Female	184	3.24	0.73		
Male	27	2.96	0.81		
Fine Arts	211	3.25	0.83	2.48*	0.02
Female	184	3.30	0.82		
Male	27	2.89	0.80		
Overall GPA	212	3.25	0.43		
Female	184	3.30	0.42		
Male	28	2.95	0.33		

* indicates statistical significance

Table 3
Correlation of Course Grades and Group Embedded Figures Scores

Courses	Initial	Intern	FED 104	HY 102	EH 102	BI 101	COM 101	Fine Arts
Initial		0.78* 0.0001	0.19* 0.007	0.09	0.18* 0.009	0.11	0.08	0.14* 0.04
Intern			0.22* 0.002	0.16* 0.02	0.20* 0.003	0.16* 0.02	0.10	0.17* 0.01
FED 104				0.32* 0.0001	0.30* 0.0001	0.29* 0.0001	0.30* 0.0001	0.20* 0.003
HY 102					0.37* 0.0001	0.37* 0.0001	0.38* 0.0001	0.24* 0.0005
EH 102						0.45* 0.0001	0.38* 0.0001	0.36* 0.0001
BI 101							0.40* 0.0001	0.33* 0.0001
COM 101								0.37* 0.0001
Fine Arts								

* indicates significance and p is below on the next line.

Table 4

Mean Difference Scores for Course Grades and t-test

COURSE	Mean /	Differences	Mean	SD	T	p
FED 104	3.40					
		- HY 102	0.67	1.03	9.37*	0.0001
		- EH 102	0.46	0.96	7.04*	0.0001
		- BI 101	0.57	1.02	8.18*	0.0001
		- COM 101	0.18	0.90	2.97*	0.003
		- Fine Arts	0.15	1.01	2.18*	0.03
HY 102	2.73					
		- EH 102	-0.20	1.02	-2.90*	0.004
		- BI 101	-0.09	1.06	-1.29	0.20
		- COM 101	-0.48	0.97	-7.15*	0.0001
		- Fine Arts	-0.52	1.11	-6.80*	0.0001
EH 102	2.93					
		- BI 101	0.11	0.92	1.71	0.09
		- COM 101	-0.28	0.89	-4.59*	0.0001
		- Fine Arts	-0.32	0.94	-4.90*	0.0001
BI 101	2.82					
		- COM 101	-0.38	0.92	-6.06*	0.0001
		- Fine Arts	-0.42	1.01	-6.05*	0.0001
COM 101	3.21					
		- Fine Arts	-0.03	0.88	-0.55	0.58
Fine Arts	3.25					

* indicates statistical significance

Table 5

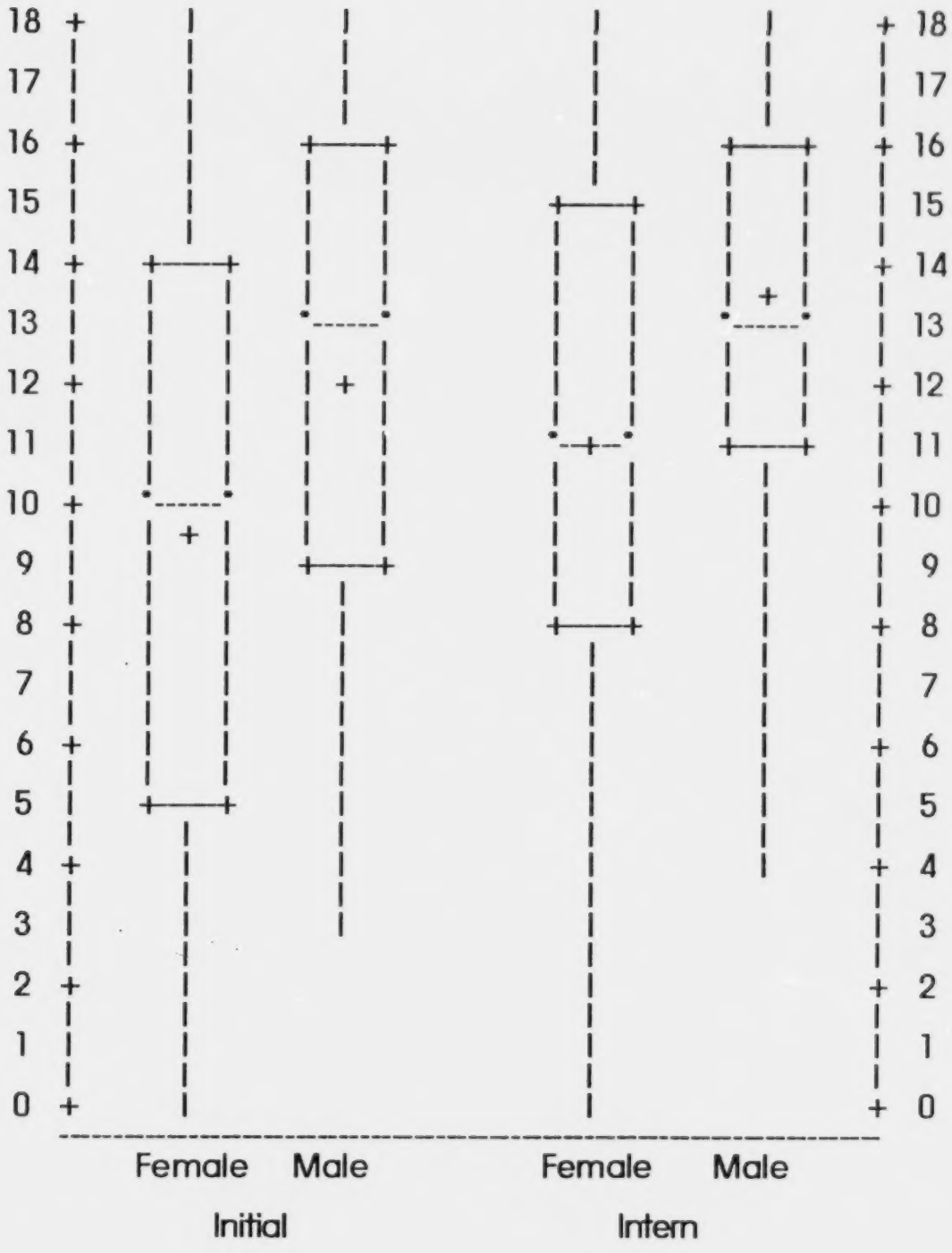
Comparison of Course Grades by Intern Embedded Figures Scores

Course	Grade	N	Mean	SD	DF	F Value	P
FED 104					4, 207	2.74*	0.03
	A	114	11.96	4.60			
	B	73	10.99	4.65			
	C	21	9.67	4.86			
	D	2	6.50	7.78			
	F	2	5	1.41			
HY 102					4, 207	2.45*	0.05
	A	51	11.86	4.77			
	B	76	11.53	4.87			
	C	64	11.50	4.42			
	D	18	8.33	4.28			
	F	3	8.00	4.58			
EH 102					4, 207	3.52*	0.01
	A	60	12.55	4.06			
	B	83	11.50	4.91			
	C	64	9.86	4.64			
	D	4	8.75	6.02			
	F	1	18				
BI 101					3, 208	2.62*	0.05
	A	59	12.39	4.08			
	B	70	11.01	4.95			
	C	69	11.12	5.00			
	D	14	8.71	3.87			
COM 101					2, 208	1.47	0.23
	A	85	11.99	4.66			
	B	85	10.86	4.73			
	C	41	10.85	4.73			
Fine Arts					3, 207	2.35	0.07
	A	97	12.21	4.35			
	B	76	10.83	4.91			
	C	31	10.16	4.31			
	D	7	9.86	6.47			

* indicates statistical significance

Figure Caption

Figure 1. Box plot by gender of group embedded figures scores for both initial and intern testing.


18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Female
Male
Female
Male
Initial
Intern